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Noise Impact Assessment & Noise Survey

Client: Mr Shahid Choudry

Address: 20 Derby Street

Manchester

Greater Manchester

M8 8RY

Date: 18/12/2016

Prepared By:	A. T Martin, MSc, MIET, AMIOA
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Date:	18/12/16
Document Reference:	1157SH

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Executive summary

An environmental noise survey and noise impact assessment has been undertaken at the proposed residential development at the First Floor of 20 Derby Street, Manchester, Greater Manchester, M8 8RY to assess the suitability of site for residential development. The measured ambient sound levels have allowed a BS8233:2014 noise assessment to be carried out.

The BS8233:2014 assessment of expected sound levels incident on the proposed residential dwelling shows that glazing in all bedrooms and living areas requires a minimum attenuation of 35.0 dB R_w. Ventilation with a minimum Dn,e,w of 35.0 dB should also be installed in habitable rooms. This will protect the amenity of the future occupants in relation to noise from the surrounding noise sources.

Outline mitigation measures have been recommended in section 6.0, including glazing and ventilation. These recommendations should be sufficient to achieve the internal noise levels for the proposed development according to BS8233:2014 noise criteria. Written approval of the findings of this report is required from the Local Authority prior to works commencing.

1. Introduction

NOVA Acoustics Ltd has been commissioned by Mr Shahid Choudry to provide a noise assessment in support of planning application, No. 109032/P3JPA/2015/N1, to assess the suitability of the proposed change of use from Office (Class B1(a)) to 5 class C3(a) residential units located at 20 Derby Street.

The purposes of this report are:

- Determine the existing noise climate at the dwelling locations due to road noise and commercial/industrial noise.
- Determine the acoustics performance of the separating floor between the ground floor offices and first floor.
- Detail the proposed attenuation/design necessary to protect the amenity of the occupants of the new residences (including ventilation).

2. Legislation, Policy and Guidance

This report is to be primarily based on the following legislation, policy and guidance:

1) The National Planning and Policy Framework (2012)
2) The Noise policy Statement for England (2010)
3) BS 8233:2014 Guidance on sound insulation and noise reduction for buildings

2.1 English Planning Policy on Noise Impact – NPPF and NPSE

The NPPF is the over-arching planning and policy document that applies to all new developments in England. The guidance and assessment criteria given (or referred to) in this document can therefore be applied to all standards in terms of assessing the suitability of granting planning permission with respect to noise impact.

The NPPF states that planning policies and decisions should aim to:

- Avoid noise giving rise to significant adverse impact on health and quality of life as a result of a new development;
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from new developments, including through the use of conditions.
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions placed upon them because of changes in nearby land uses since they were established; and
- Identify and protect areas of tranquillity, which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

With specific reference to noise impact, the NPPF document refers to the noise policy statement for England (NPSE). The NPSE provides guidance which enables decisions to be made regarding the acceptable noise burden to place on society, using three key phrases – the No Observed Effect Level (NOEL), the Lowest Observed Adverse Effect Level (LOAEL) and the Significant Observed Adverse Effect Level (SOAEL).

In order to provide a consistent frame of reference (and to allow a view to be taken on the suitability of the application with reference to the relevant planning guidance), the levels criteria given in other relevant documents used in assessment will be re-framed in terms of the following:

NOEL: The level of noise impact below which no effect can be detected, and there would be no discernible negative effect on health or quality of life.

LOEL: The lowest level of noise impact which adverse effect on health or quality of life can be detected. Designing noise impacts to be less than or equal to LOAEL should see that any adverse effects on health or quality of life are negligible.

SOAEL: The level above which significant adverse effect to health and quality of life occur. Designs should always seek to avoid a noise impact, which would be categorised as SOAEL.

2.2 BS8233:2014

The BS8233-2014 "Sound insulation and noise reduction for buildings code of practice"; gives absolute noise limits for steady state anonymous noise (such as road traffic) inside residential properties. Table 1.0 outlines these target limits.

BS8233-2014 Target limits			
Activity	Location	07:00 – 23:00	23:00–07:00
Resting	Living Rooms	35dB LAeq,16Hour	-
Dining	Dining Room	40dB Laeq,16Hour	-
Sleeping	Bedroom**	35dB Laeq,16Hour	30dB Laeq,8Hour
	** For a reasonable standard in bedrooms at night, individual noise at night (measured with F time-weighting) should normally not exceed 45 dB LAmax (BS8233:2014).		

Table 2.0

3. Site Description & Background

The proposed development is to convert the first floor of the site from offices to create 5 class C3(a) residential units. The site is located on Derby Street, in a commercial area just off Manchester City Centre. The site has a moderate level of noise and the prevailing noise source is represented by the traffic noise which is a mixture of cars, LGV and HGV vehicles operating among the several commercial units in the surrounding area. Further to this one of the premises in the area is a place of worship and this may increase the traffic flow. The early hours of the day time (7.00 h – 11.00 h) are expected to be the periods of highest likely impact upon the site.

4. Environmental Noise Survey

In order to characterize the sound profile of the area of the proposed development, a 24 hour environmental sound survey was carried out from Tuesday 12th December to Wednesday 13th December.

4.1 Measurement locations

For the long term sound monitoring, the sound level meter was placed at 1st floor level, protruding from a window of the proposed site. The microphone was positioned approximately 1m away from the building's façade. The monitoring position was chosen in order to collect representative sound levels of the area during a weekday for the day time and night time periods. The position was also representative of the highest expected sound levels at the site. The measurement position can be found in appendix C.

4.2 Measurement equipment

Piece of Equipment	Serial No
SVAN 977 Class 1 Sound Level Meter	34826
SVAN Class 1 Calibrator SV31	029791 - 1

Table 3.0

4.3 Weather summary

As the environmental noise survey was carried out over a short un-manned 24 hour period no records of weather conditions were taken. However During the set up and collection of the monitoring equipment the weather as calm with wind speeds of less than 5m/s and no precipitation. All measurements have been compared with met office weather data of the area and periods of elevated weather conditions have been excluded from the subsequent calculations.

4.4 Results

Table 4.0 shows the LAeq, LAmax, LA10 and the LA90 for both the day and night time period measured at the façade.

Time Period	**LAEQ**	**LAMAX**	**LA90**	**LA10**
Day 1 (11:17 - 22:57)	61.8	88.5	59.1	65.5
Night (23:02 – 6:57)	**56.8**	84.0	47.4	61.1
Day 2 (7:02 – 11:22)	**66.2**	90.6	62.0	68.9

Table 4.0

Discussion

The maximum noise level measured during the night time period is 84.0 dB $L_{AMax,8hour.}$ When using maximum noise levels to assess the noise profile of an area consideration must be given to the frequency of events. The histogram in appendix E shows the most repeated value as 77.0 dB $L_{AMax,8hour,}$ this value was exceeded 18 times throughout the nighttime period. It is deemed more appropriate to use a value of 80.0 dB $L_{AMax,8hour}$ as this was only exceed 6 times throughout the night period and will present a robust façade specification.

4.5 Subjective impressions & context

Whilst on site it was found that the dominant source of noise was from general road traffic, the neighboring commercial premises presented no definable noise. Upon inspection the mixed source noise emissions were moderate as can be seen in the measurement time history in appendix E. Providing adequate mitigation is installed the amenity of the future residents can be protected.

4.6 Uncertainty

Efforts have been taken to address the uncertainty in the measurement and calculation of the level of impact. The following points have been addressed:

1) The most exposed measurement position has been chosen to ensure a robust survey.
2) The ambient sound environment during the measurement period did not vary significantly.
3) The background measurement location was within close proximity to the proposed dwelling.
4) Meteorological conditions were appropriate for the measurement of environmental noise.
5) Short measurement time intervals were used to show short term increases in ambient sound levels.
6) All figures are rounded to the nearest 0.1dB.
7) The instrumentation used is class 1 and within calibration.
8) A in depth analysis of ambient sound levels has been undertaken to ensure the figure used is consistent across the monitoring period.
9) Approved standards have been used to complete any calculations.

5. Assessment Methodology

5.1 BS8233:2014 Internal noise impact assessment

The table below outlines the noise levels predicted in each room and the target limits to be achieved. A composite sound reduction index for the glazing to be installed is calculated as a result of the subtraction of the target limit from the actual levels measured.

Measurement position	Area	Period	Noise Levels Measured	Level to be achieved	Composite SRI Required
MP1	Living Room	Day time	66.2 dBA	35 dB $L_{Aeq,16Hour}$	31.2 dB
	Dining Room	Day time	66.2 dBA	40 dB $L_{Aeq,16Hour}$	26.2 dB
	Bedroom	Day time	66.2 dBA	35dB $L_{Aeq,16Hour}$	31.2 dB
	Bedroom	Night time	56.8 dBA	30dB $L_{Aeq,8Hour}$	26.8 dB
	--	--	80.0 dBA	45 dB L_{AFmax}	35.0 dB

Table 5.0.

Discussion:

As can be seen by the analysis in table 5.0 the windows require glazing with an attenuation of 35.0dB Rw to protect against maximum noise events and 31.2dB Rw + Ctr to protect against road noise. This is recommended for all windows within the property.

5.2 Noise breaking through adjoining floor

The separating floor between the commercial premises on the ground floor and the first floor flats has been assessed in order to minimize noise breaking through. The performance of the floor in terms of Airborne Sound Insulation has been tested following the procedures of the Building Regulations Part E and achieves the value 45 dB $D_{nT,w} + C_{tr}$. Thus it complies with the requirements within the building regulations of $D_{nT,w} + C_{tr} > 43$ dB for dwelling-flats formed by material change of use. However, Approved Document E states:

"A higher standard of sound insulation may be required between spaces used for normal domestic purposes and communal or non-domestic purposes. In these situations the appropriate level of sound insulation will depend on the noise generated in the communal or non-domestic space. Specialist advice may be needed to establish if a higher standard of sound insulation is required and, if so, to determine the appropriate level."

The acceptability of the acoustic performance of the partition floor is dependent on the usage of the retail space, the retail space has a planning classification A1, defined as follows:

B1 Business - *Offices (other than those that fall within A2), research and development of products and processes, light industry appropriate in a residential area.*

To provide a robust analysis, noise emissions from a busy call center have been used to provide an indication of the performance requirements. Table 6.0 shows measurements undertaken within a call center with up to 30 staff present.

Measurement Position	$L_{Aeq, t}$	$L_{Amax,t}$	LA10	LA90
MP1	68.0	82.6	69.6	65.2
MP2	74.2	87.3	76.0	71.4
MP3	58.6	79.6	62.0	53.3

Table 6.0

For the purposes of this assessment the loudest values measured at MP2 will be used of 74.2dB. This is considered to be a robust analysis, as the B1 usage is not expected to have noise emissions this high.

Sound insulation calculations have been carried out on the proposed separating floor in order to minimize sound transference between the properties.

The airborne sound insulation calculations have been carried out with software INSUL, which is a program developed for predicting the sound insulation performance of walls, floors, ceilings and windows. The program can estimate the Transmission Loss (TL) in 1/3 octave bands and Weighted Sound Reduction Index (STC or Rw) for use in sound transfer calculations. Like any prediction tool INSUL is not a substitute for measurement. However, comparisons with test data indicate that INSUL reliably predicts STC values to within 3dB for most constructions.

To protect the amenity of the occupants of the flat the construction detail in Appendix G should be installed, this partition floor provides a calculated acoustic performance of 56dB Dnt,w +Ctr. Considering the acoustic performance of the floor and the required internal noise level of 30dB $L_{aeq,8hour}$, the noise emissions within the commercial space would need to exceed 86dBA to affect the amenity of the occupants of the dwelling. As can be seen the measurements taken within a busy call centre are range of 74.2dB LAeq,t, thus the partition floor as installed is expected to be sufficient to protect the amenity of the future occupants.

6. Mitigation & Recommendations

6.1 Recommendations for a BS8233 assessment

6.1.1 Façade & Roof

The noise levels within the proposed dwellings will be dictated by the configuration, materials and elements of the façade. The non-glazed elements of the facade will contribute significantly to the reduction of ambient noise levels in combination with a good quality appropriate glazing specification. The prediction of the performance of the facade is based upon a construction of 200mm brick and is calculated within INSUL software, the expected performance is shown in table 7.0.

63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	Rw
41	44	42	47	55	63	68	53

Table 7.0

The ceilings on the top floor should consist of 100mm 45kg/m2 fitted tightly between the 200mm roof joists and 2no. 15mm SoundBloc plasterboard fixed to resilient bars to achieve a uniform sound reduction. The expected performance as predicted within INSUL software is shown in Table 8.0.

63Hz	**125Hz**	**250Hz**	**500Hz**	**1000Hz**	**2000Hz**	**4000Hz**	**Rw**
33 dB	45 dB	52 dB	57 dB	60 dB	57 dB	61 dB	58 dB

Table 8.0

Any other configuration in walls and ceilings that would achieve at least these insulation figures will be suitable for the development.

6.1.2 Glazing

Windows can be considered the weakest point of a façade in terms of noise reduction from external noise.

Living rooms and Bedrooms

Glazed elements installed in all the living rooms and bedrooms require a minimum sound reduction index value of 35.0 dB Rw. The glazing unit shown in table 9.0 would provide a suitable sound reduction. Any other window capable of providing an attenuation of 35.0dB Rw will be suitable. The performance is specified for the whole window unit, including frame and other design features.

Glazing Type	**Sound Reduction** (Rw)	**Sound Reduction** (Rw + Ctr)
Double Glazing System 10mm glass/6mm cavity/12mm glass	38 dB	32 dBA

Table 9.0

The glazing system above will protect the amenity of the occupants of the dwellings against the extraneous noise. The glazing specifications have been taken Pilkingtons range however any glazing providing the same attenuation can be used.

6.1.3 Ventilation

Considering windows open in the noise impact assessment providing a sound attenuation of 12dB, this would lead to internal noise levels as shown in Tables 10.0.

Area	Period	Noise Levels Measured $L_{Aeq,T}$	Open window	Internal noise levels $L_{Aeq,T}$	Noise Criteria	Level above criteria
Bedroom	Night time	56.8 dBA	- 12	44.8 dBA	30 dB	14.8 dB
Bedroom	Day time	66.2 dBA	- 12	54.2 dBA	35 dB	19.2 dB
Living Room	Day time	66.2 dBA	- 12	54.2 dBA	35 dB	19.2 dB

Table 10.0

To ensure adequate ventilation without noise impact, a ventilation system with a minimum attenuation of 35.0 dB should be installed. This should be installed within habitable rooms. The units in table 11.0 will be sufficient or any system capable of providing the required attenuation and that complies with Part F of building regulations.

Model	Sound Attenuation level with the system open:
Titon Sonair F+	55dB
Simon Acoustic Trickle Ventilation	38dB Open / 41dB Closed

Table 11.0

7. Conclusion

An environmental noise survey and noise impact assessment has been undertaken at the proposed residential development at the First Floor of 20 Derby Street, Manchester, Greater Manchester, M8 8RY to assess the suitability of site for residential development. The measured ambient sound levels have allowed a BS8233:2014 noise assessment to be carried out.

Outline mitigation measures have been recommended in section 6.0, including glazing and ventilation. These recommendations should be sufficient to achieve the internal noise levels for the proposed development according to BS8233:2014 noise criteria. Written approval of the findings of this report is required from the Local Authority prior to works commencing.

Appendix A – Terms Glossary

Acoustic environment: sound from all sound sources as modified by the environment

Ambient sound: totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far

Ambient sound level *L*a = *L*Aeq,*T*: equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval

Background sound level, *L*A90,*T* : A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels

Equivalent continuous A-weighted sound pressure level, LAeq,*:* value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, T = t2 – t1, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation:

Measurement time interval, Tm: total time over which measurements are taken

Rating level, LAr,Tr: specific sound level plus any adjustment for the characteristic features of the sound

Reference time interval, Tr: specified interval over which the specific sound level is determined

Residual sound: ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound

Residual sound level, Lr = LAeq,T*:* equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T

Specific sound level, Ls = LAeq,Tr: equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr

Specific sound source: sound source being assessed

Appendix B – Calibration Certificates

Piece of Equipment	**Serial No**	**Pre calibration**	**Post calibration**
Svantek Class 1 Sound Level Meter Svan 977	34826	0.42	0.47
Svantek Class 1 Sound Level Meter	32569		

Calibration certificate of the sound level meter



Calibration Report Certificate No.:026788-1

Svan Type : 977 Serial no : 34826

Customer: Nova Acoustics Ltd
Address: Leeds

Microphone :	ACO	Type : 7052	Serial no : 55916	Sens:-29.12dB
Pre amplifier	Svantek	Type : SV 12L	Serial no : 33048	
Calibrator :	Svantek	Type : SV31	Serial no : 32569	Level:114.06dB

Measured with Pre Amplifier — Mains adapter was included
Interface cable was included

Measurement Results:

Noise Test - IEC 60651 Clause 9.4.1 & 9.4.3	Passed
Input Amplifier Test: Gain Test / Attenuator setting - IEC 60651, Clause 6.3	Passed
Level Linearity Test - IEC 60651, Clause 7.9 & 7.10	Passed
Weighting Network Test : A Network - IEC60651 Clause 9.2.2	Passed
Weighting Network Test : B Network - IEC 60651 Clause 9.2.2	Passed
Weighting Network Test : C Network - IEC 60651 Clause 9.2.2	Passed
Weighting Network Test : Flat Network - IEC 60651 Clause 9.2.2	Passed
Overload Detector Test : A-Network - IEC 60651 Clause 9.3.1	Passed
Overload Detector Test : Square wave - IEC 60651 Clause 9.3.1	Passed
F/S/I/Peak Test : Steady State Response - IEC 60651 Clause 7.4	Passed
Fast-Slow Test : Overshoot test - IEC 60651 Clause 9.4.1	Passed
Fast-Slow Test: Single Sine Wave Burst - IEC 60651 Clause 9.4.1 & 9.4.3	Passed
Impulse Test : Continuous Sine Wave Burst - IEC 60651 Clause 9.4.3	Passed
Impulse Decay Time Test - IEC 60651 Clause 7.3	Passed
Peak Detector Test, single square wave burst - IEC 60651 Clause 9.4.4	Passed
RMS Detector Test : Crest Factor Test - IEC 60651 Clause 9.4.2	Passed
Time Averaging Test: Pulse Range - IEC 60804 Clause 9.3.4	Passed
Time Averaging Test : Averaging Functions - IEC 60804 Clause 9.3.2	Passed
Linearity Test - IEC 804 Clause 9.3.3	Passed

Measurement procedure: ACP01

Environmental conditions:

Pressure :	Temperature :	Relative humidity :
99.989 kPa	23.4 °C	45.2 %RH

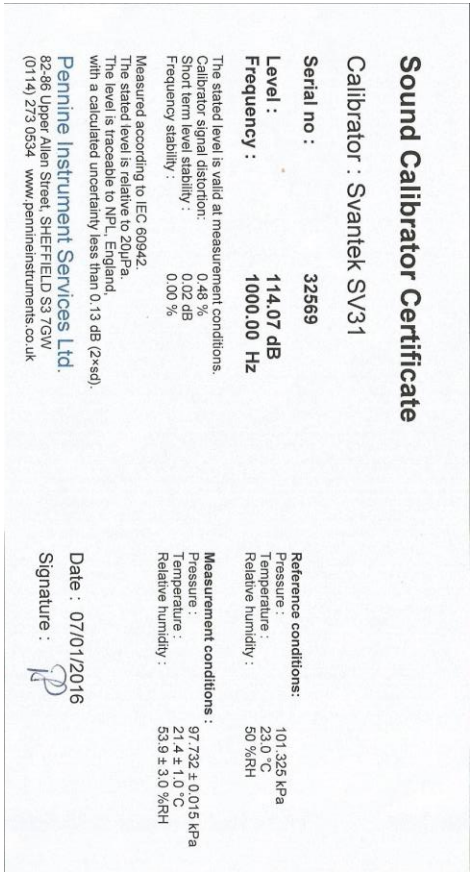
Date of calibration: 19/12/2014
Date of issue: 19/12/2014
Supervisor: M.Batty
Engineer

M Batty

Software version 5.0

pennineinstrumentservicesltd
82-86 Upper Allen Street, SHEFFIELD S3 7GW
(0114) 273 0534 www.penninеinstruments.co.uk

Calibration certificate of the calibrator



Sound Calibrator Certificate

Calibrator : Svantek SV31

Serial no : 32569

Level : 114.07 dB
Frequency : 1000.00 Hz

The stated level is valid at measurement conditions.
Calibrator signal distortion: 0.48 %
Short term level stability : 0.02 dB
Frequency stability : 0.00 %

Measured according to IEC 60942.
The stated level is relative to 20µPa.
The level is traceable to NPL, England.
with a calculated uncertainty less than 0.13 dB (2×sd).

Reference conditions:
Pressure : 101.325 kPa
Temperature : 23.0 °C
Relative humidity : 50 %RH

Measurement conditions :
Pressure : 97.732 ± 0.015 kPa
Temperature : 21.4 ± 1.0 °C
Relative humidity : 53.9 ± 3.0 %RH

Pennine Instrument Services Ltd.
82-86 Upper Allen Street, SHEFFIELD S3 7GW
(0114) 273 0534 www.penninеinstruments.co.uk

Date : 07/01/2016
Signature :

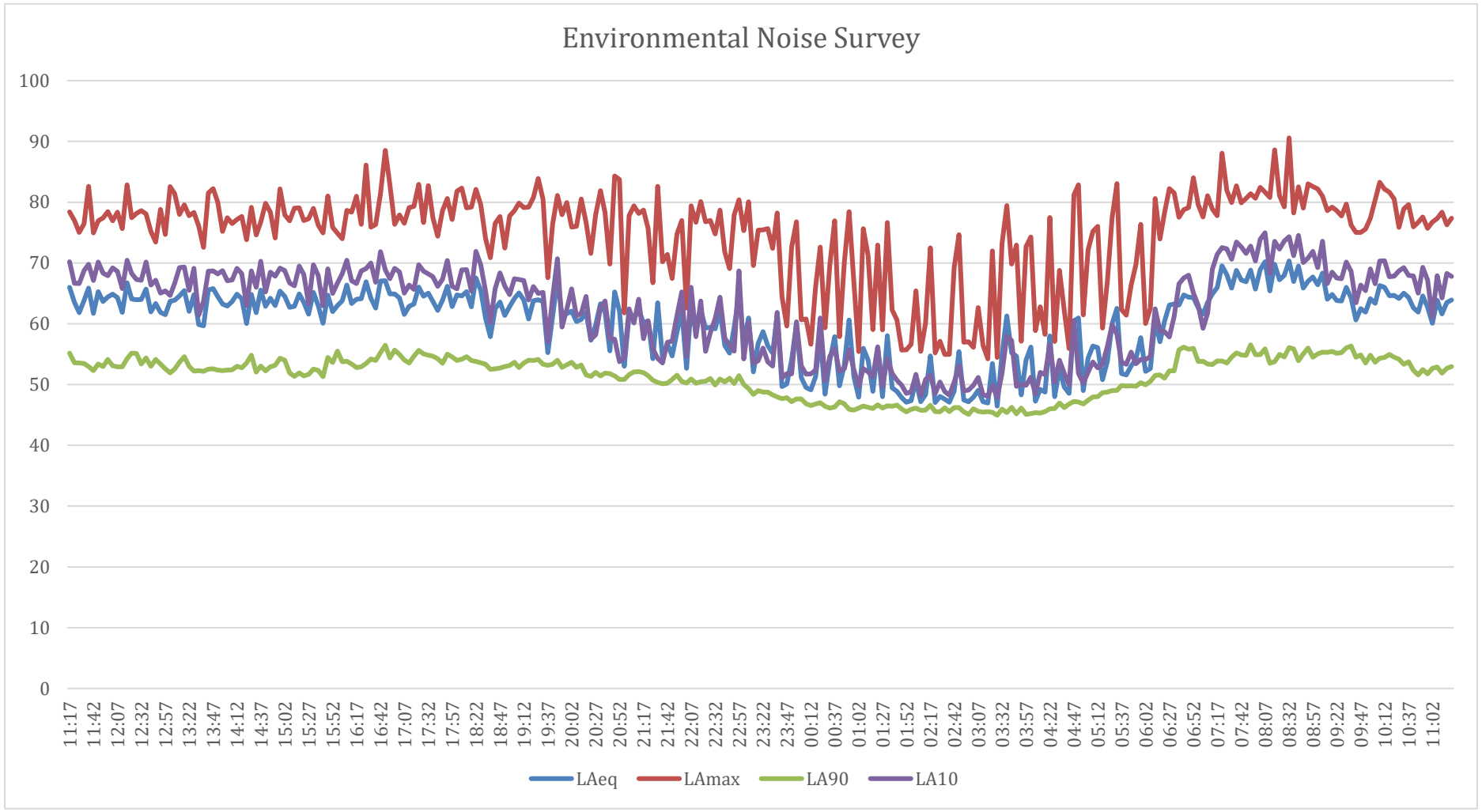
Appendix C – Location Plan

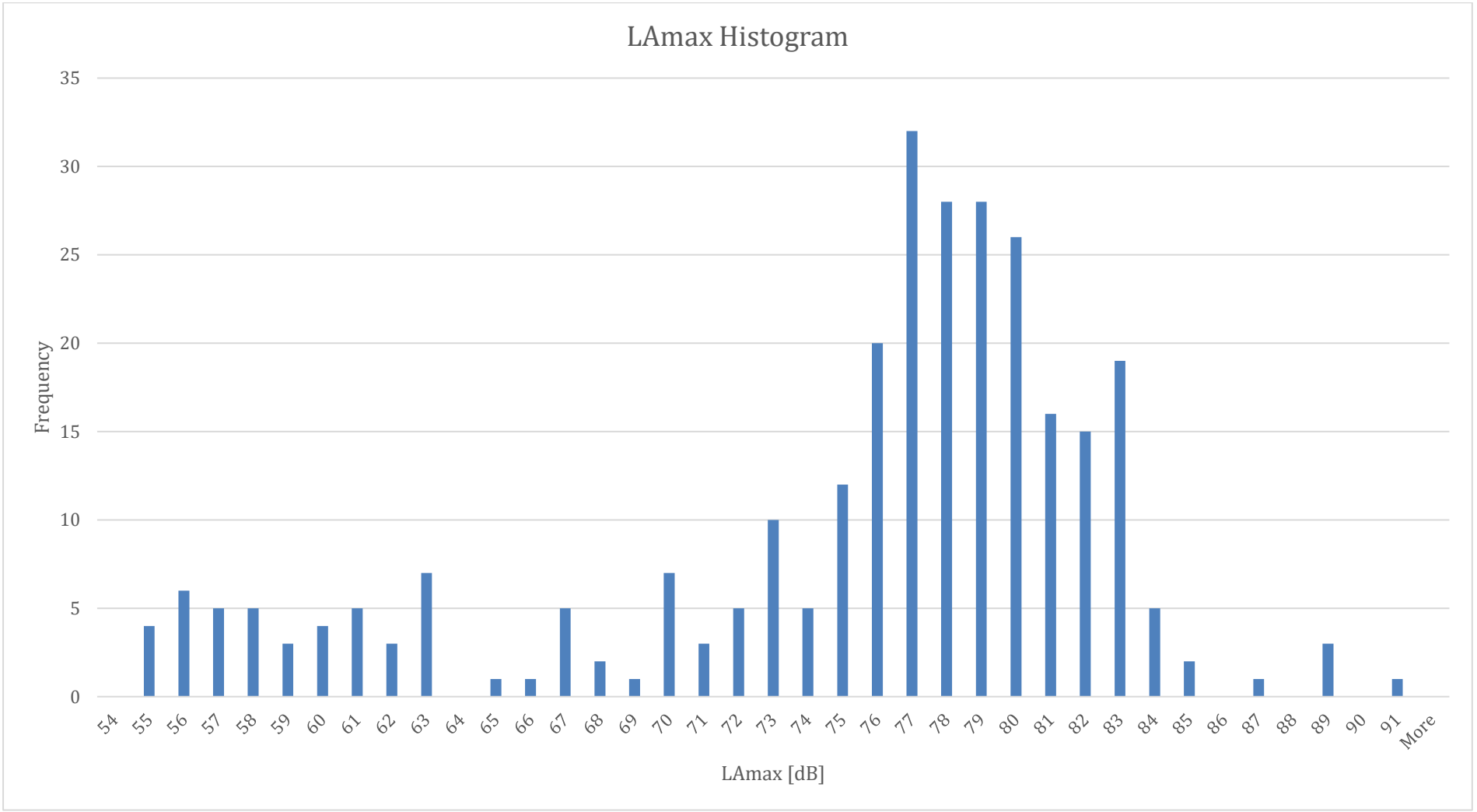


Appendix D – Site Plans & Layouts



Appendix E – Environmental Sound Survey




LAmax Histogram
Frequency
35
30
25
20
15
10
5
0
54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 More
LAmax [dB]

Appendix F – Partition Floor Performance

Standardized level difference according to Resistance to the passage of sound approved document E
Field measurements of airborne sound insulation between rooms

Client : Shahid Choudry

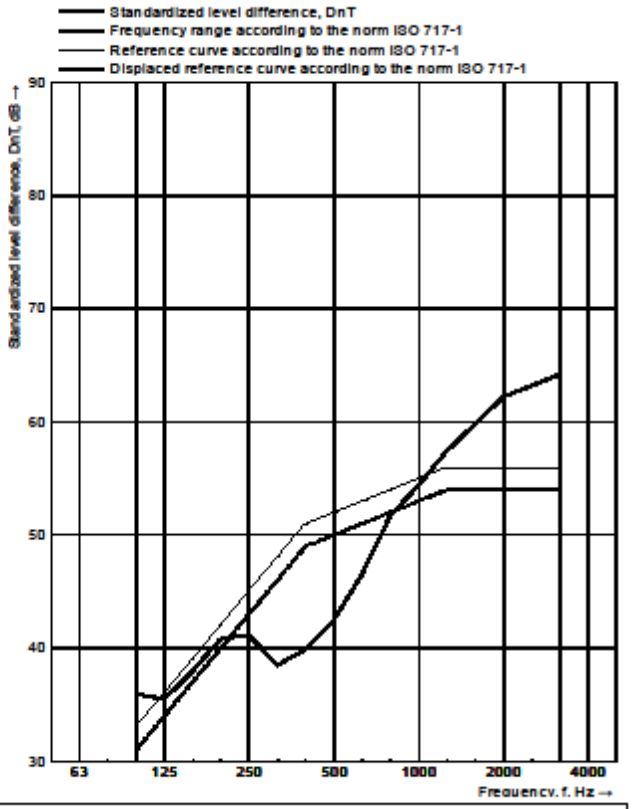
Test date : 13 December 2016

Description and identification of the building construction and test arrangement, direction of measurement :

See pages 1 & 2.

Source room volume : 100.00 m³
Receiving room volume : 58.00 m³

Frequency f Hz	DnT (1/3 octave) dB
50	–
63	–
80	–
100	36.0
125	35.5
160	38.0
200	40.8
250	41.2
315	38.5
400	39.9
500	42.5
630	46.5
800	51.7
1000	54.4
1250	57.4
1600	59.8
2000	62.2
2500	63.2
3150	64.2
4000	–
5000	–



Rating according to ISO 717-1

DnT,w(C;Ctr)= 50 (-2 ; -5) dB;

Evaluation based on in situ measurement results obtained by an engineering method (1/3 octave)

No. of test report : 1157SH - A

Name of test institute : NOVA Acoustics Ltd

Date : 13 December 2016

Signature : Adam Martin

Appendix G – Proposed partition floor design

Impact Sound Prediction (v8.0.9)

Program copyright Marshall Day Acoustics 2015

INSUL

Microsoft - Key No. 2597

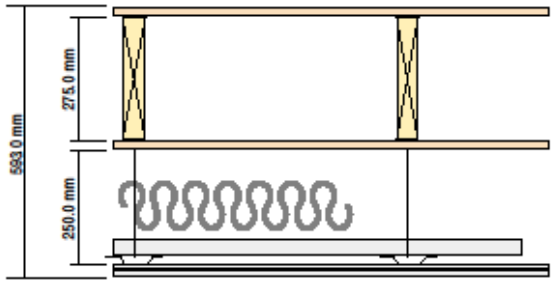
Margin of error is generally within Rw +/- 3 dB

Job Name:

Job No.: Page No.: Notes:

Date: 29 Nov 16 Initials:Adam Martin

File Name: insul



Rw 58 dB
C -1 dB
C_{tr} -4 dB
D_{nTw} 60 dB

System description

Panel 1 : 1 x 18.0 mm HardBoard (ρ:960 kg/m3,E:0.83GPa,η:0.01)

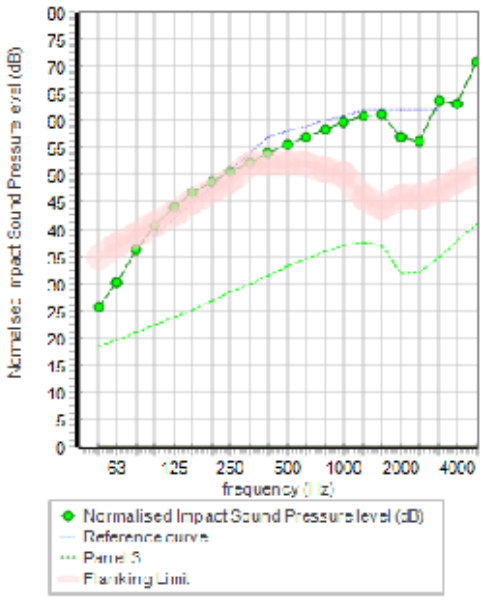
Cavity : Solid joist(timber or Twinaplate): Stud spacing 600 mm
Panel 2 + 1 x 20.0 mm HardBoard (ρ:960 kg/m3,E:0.83GPa,η:0.01)

Cavity : Suspended light steel grid: Stud spacing 600 mm , Infill Rockwool (33kg/m3) Thickness 100 mm (ρ:33 kg/m3, Rf:13400 Pa.s/m2)
Panel 3 + 2 x 15.0 mm Gyproc SoundBloc 15mm (ρ:840 kg/m3,E:3.1GPa,η:0.01)

Mass-air-mass resonant frequency =27 Hz , 51 Hz

Panel Size 2.7x 4 m; Mass 65.0 kg/m2

frequency (Hz)	Ln(dB)	Ln(dB)
50	26	
63	30	29
80	36	
100	41	
125	44	43
160	47	
200	49	
250	51	50
315	52	
400	54	
500	56	55
630	57	
800	59	
1000	60	60
1250	61	
1600	61	
2000	57	58
2500	56	
3150	64	
4000	63	65
5000	71	



Disclaimer

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